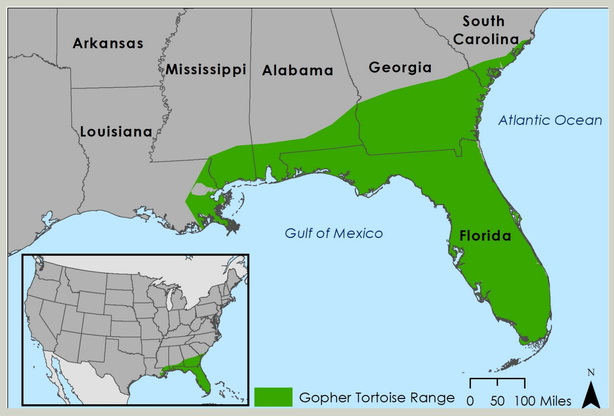
Renewable Energy or Tortoise Turmoil?

Habitat Suitability Analysis for the Mitigation of Gopher Tortoise and Solar Development Conflict

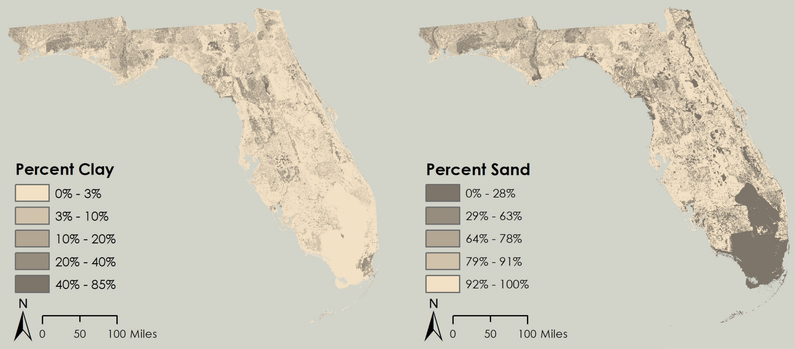
Gopher Tortoise: Keystone Species

The gopher tortoise (*Gopherus polyphemus*) is an endemic keystone species to the longleaf pine-wiregrass ecosystem of the Southeastern United States. Gopher tortoises are listed as endangered west of Mobile Bay and are currently being considered for listing in their eastern range. Current conservation practices for the gopher tortoise are proving successful, but the species has been introduced to a new threat, solar farm development. Solar farm development is becoming extremely common in the Southeast due to the prevalence of private landowners willing to lease their large plots of land to solar developers for a fraction of the cost of land in other areas of the country. Solar farms require large areas of open land, causing large areas of undeveloped land to become extremely low quality wildlife habitat. Approximately **80 percent of the gopher tortoise range is owned by private landowners,** making it difficult for consistent habitat conservation to occur across their range. This habitat suitability analysis will use various environmental factors and gopher tortoise observation density to determine what private land to prioritize for future conservation efforts in the state of Florida. All habitat suitability criteria were based on published habitat suitability indices used by field biologists (Inkley 1986, NRCS 2017).



Gopher tortoises dig burrows up to 45 feet in length. Over 300 species use gopher tortoise burrows to meet life requisites such as cover and nutritional needs. Species include: the eastern indigo snake, gopher frog, eastern diamondback rattlesnake, pine snake, Florida mouse, burrowing owl, and many more vertebrate and invertebrate species. Many of these species are of conservation concern (FFWCC, n.d.). They also share their habitat with the federally endangered red-cockaded woodpecker (Cornell University, 2017).

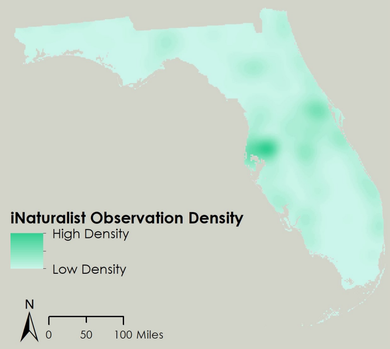
Soil Texture



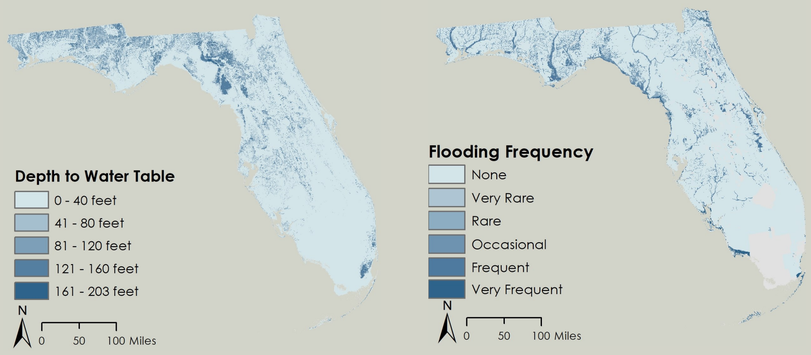
Soil texture influences the gopher tortoise's ability to dig burrows that support their natural history characteristics and provide adequate cover. Sandy soils allow the gopher tortoise to easily dig their extensive burrows.

Observations of gopher tortoises are incorporated into this habitat suitability analysis as a proxy for gopher tortoise density. Observations from iNaturalist recorded by researchers from November 2018 to December 2019 were used to perform this analysis.

iNaturalist Observations

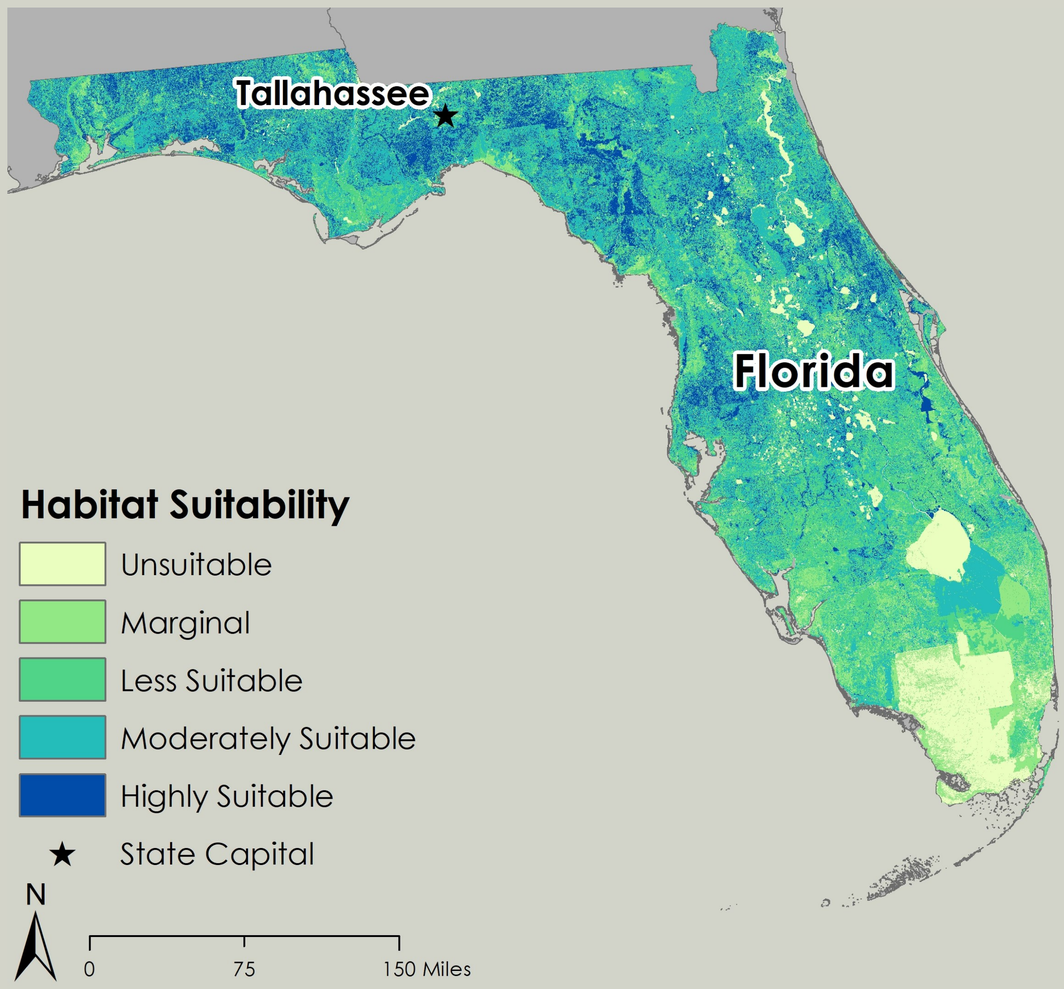


Water Features and Flooding



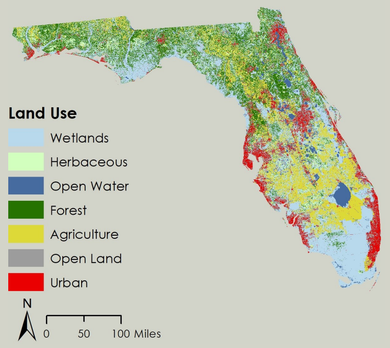
High water tables, frequent flooding and frequent ponding make an area unsuitable for gopher tortoises to dig their burrows. Burrows in places with frequent flooding and ponding would frequently collapse due to water

Results and Management Recommendations



Herbaceous vegetation is the most suitable land cover for gopher tortoise habitat because their primary food source is herbaceous plants. Gopher tortoises can also be found in areas dominated by shrub/scrub, open/barren land, and potentially urban open space.

Land Use



	Unsuitable	Marginal	Less Suitable	Moderately Suitable	Highly Suitable
Land Cover	Water, Wetlands, High/ Moderate Urban	Developed Low Intensity	Forest	Barren Land, Shrub/Scrub, Open Space	Herbaceous Vegetation
Slope	>35%	15-35%	10-15%	5-10%	<5%
Flooding	> Occasional	Occasional	Rare	None to Very Rare	None
Ponding	100-80%	60-80%	40-60%	20-40%	<20%
Percent Medium and Coarse	>35%	15-35%	10-15%	5-10%	<5%
Depth to Water	<20 inches	60-20 inches	70-60 inches	70-80 inches	>80 inches
Depth to	<20 inches	60-20 inches	70-60 inches	70-80 inches	>80 inches
Soil Texture	<15% sand >60% clay	30-15% sand 35-60% clay	50-30% sand 18-35% clay	70-50% sand 15-18% clay	>70% sand <15% clay
Percent Canopy Cover	<15%	15-30%	30-45%	45-60%	>60%

Areas of Florida highlighted above as highly suitable gopher tortoise habitat are recommended to be considered as a priority for exclusion from the future development of solar farms. Continuing federal and state conservation programs, including NRCS conservation easements, and promoting the use of published solar development best management practices will allow the gopher tortoise to coexist with the future of renewable energy.

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Projection: USA Contiguous Albers Equal Area Conic Data

Sources: ESRI, USDA, NRCS, iNaturalist, US Census Bureau